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THE ENTOMOLOGICAL SOCIETY OF VICTORIA (Inc)

MEMBERSHIP

Any person with an interest in entomology shall be eligible for Ordinary membership. Members of the Society include professional, amateur and student entomologists, all of whom receive the Society's News Bulletin, the Victorian Entomologist.

OBJECTIVES

The aims of the Society are:

(a) to stimulate the scientific study and discussion of all aspects of entomology,
(b) to gather, disseminate and record knowledge of all identifiable Australian insect species,
(c) to compile a comprehensive list of all Victorian insect species,
(d) to bring together in a congenial but scientific atmosphere all persons interested in entomology.

MEETINGS

The Society's meetings are held at the 'Discovery Centre', Lower Ground Floor, Museum Victoria, Carlton Gardens, Melway reference Map 43 K5 at 8 p.m. on the third Tuesday of even months, with the exception of the December meeting which is held on the second Tuesday. Lectures by guest speakers or members are a feature of many meetings at which there is ample opportunity for informal discussion between members with similar interests. Forums are also conducted by members on their own particular interest so that others may participate in discussions.

SUBSCRIPTIONS

Ordinary Member	$30 (overseas members $32)
Country Member	$26 (Over 100 km from GPO Melbourne)
Student Member	$18
Electronic (only)	$20
Associate Member	$ 7 (No News Bulletin)
Institution	$35 (overseas Institutions $40)

Associate Members, resident at the same address as, and being immediate relatives of an ordinary Member, do not automatically receive the Society's publications but in all other respects rank as ordinary Members.

LIFE MEMBERS: P. Carwardine, Dr. R. Field, D. Holmes, Dr. T. New, Dr. K. Walker, Daniel Dobrosak.

Cover design by Alan Hyman.

Cover photo: *Coenagrion lyelli* (mating) photographed at a swamp in Colquhoun State Forest (near Lakes Entrance) Victoria on 3rd December 2012. Photographer Reiner Richter.

Notes from the Entomological Society of Victoria combined event with Riddells Creek Landcare, 4 December 2012

Russell Best (above) who led the after dinner walk and shared his knowledge of the Riddells Creek area.

Thanks to everyone who attended the joint Riddells Creek Landcare - Entomological Society of Victoria get together in December (40+ people in total). It was a very enjoyable and productive evening despite the cold weather and the unrivalled paucity of insects because of the cold. At times the number of individuals watching the light sheets outnumbered the insects visiting the sheets, but we did still see lots of things and a surprising number that were new species records for Riddells Creek.

First the Odonata: Dragonflies, Australian Emperor, *Hemianax papuensis* (Fig. 1), the Yellow-striped Hunter, *Austrogomphus guerini* (Fig. 2).

Fig. 1

Well done to Mazia, Tyra, Lydia, Amber and others for finding this dragonfly avoiding the cold in a Cherry Ballart - it is one of the largest dragonflies, *Hemianax papuensis* - Australian Emperor (Fig. 1).

This one (Fig. 2) was spotted late in the night, *Austrogomphus guerini* - Yellow-striped Hunter;
Russell has confirmed this species once before in Riddells Creek, coincidentally very nearby, although he suspects he's seen it flying around Conglomerate Gully in Mid-Spring too.

Fig. 2

And then there were the Lepidoptera. We effectively toasted (with tea and cake!) the newly released Moths of Victoria 4 with author Peter Marriott (Marilyn and Steve from the Editorial team were there too) - and true to the occasion some of the species detailed in MoV4 appeared.

Fig.3
Chlorocoma sp. 3 a new species record for Riddells Creek - ID was made using the excellent key in MoV4!

Fig.4
Praxis edwardsi This one landed on Peter Carwardine's sheet - a new species record for Riddells Creek.

Other Lepidoptera spotted included:

Pollanisus viridipulverulenta, the satin-green forester moth was seen swimming in a puddle along the walk;
Eutrichopidia latinus was seen on the night by some;
Epidesmia hypenaria: A triangular moth with a big nose, also in MoV4 was everywhere, any walk through the local bush would disturb some of these;
Chrysolarentia severata from MoV3, was IDed by Marilyn Hewish;
Phelotis cognata from one of the next MoV books currently in production, was also seen.
Only a single male *Heteronympha merope* was seen on the evening although they were thick in the area in the warmth of the next day.

Other insects seen included:
A not yet identified weevil spotted by Josh;
Lacewing eggs spotted on the night by Peter Carwardine;
Harmonia conformisa (Coccinellidae), a ladybird beetle and a new species record for Riddells Creek, found by Jordan (well found Jordan!).
Leptotarsus (Macromastix) species (where *Macromastix* is a subgenus name), a Cranefly with remarkably long antennae;

Humans attracted to light sheets....

A Dermaptera or earwig similar to the common brown earwig (*Labidura truncata*) spotted by Josh while kneeling near a lovely Bull Ant. Two other types of ants, a *Polyrhachis* species and *Rhytidoponera metallica* (Fig. 5) were also photographed by Josh.

Fig. 5

Finally thanks to all Riddells Creek Landcare members who made us feel warmly welcomed on a chilly evening, especially Russell Best who provided most of the information in this report and Ross Colliver for providing the venue. Also thanks to Marilyn and Dean Hewish and Peter Carwardine for providing the lightsheets and thanks to everyone who attended and made the evening such a success.

And searching in the native grasses.

New host plants for *Candalides (Cyprotides) cyprotus* (Lycaenidae) in South Australia.

R. Grund.
9 Parkers Rd, Torrens Park, Adelaide, S.A., 5062

Candalides (*Cyprotides*) *cyprotus* is widespread in South Australia (SA) , but is considered to be rare in its occurrence. Males are sometimes seen hill topping in very low numbers while females are very occasionally seen flying around host plants. Its presence in an area is usually determined by the occurrence of its eggs on a hostplant. Unlike on the eastern Australian seaboard where the butterfly uses the yellow flowered pea *Jacksonia scoparia* (Fabaceae) and *Conospermum taxifolium* (Proteaceae) as its larval hosts (Braby 2000), it has only been seen to use Proteaceae plants in SA. Very similar plants such as the yellow flowering *Viminaria juncea* (Fabaceae) and also *Conospermum patens* occur in SA yet the butterfly has never been seen to utilise these plants as a natural host (Grund 1997). Until recently, in SA it has been seen to use the low growing red flowered *Grevillea huegelii* and the yellowish-white flowered *Hakea leucoptera* (Grund 1997).

In all documented cases in SA the female is only known to oviposit on the flower buds of the host plants, where the white egg is obvious on the red flowers of *G. huegelii*, but invisible on the *Hakea leucoptera* flowers. Mature larvae are very rarely seen on the hosts and it would seem they might retire to the base of the plants during the day (under bark or within the nest of their attendant ants), although they have never been recorded in that position. However, larvae in captivity usually take on a similar cryptic colour to the flowers that they are fed, which would suggest that in the wild they are probably camouflaged somewhere within the flowers.

After 1997 the author has repeatedly examined the flowers of the tree grevilleas and hakeas for early stages of *C. cyprotus* in the inland areas of SA, initially without results. However, the author recorded the butterfly for the first time in Central Australia near Mt Connor (Grund 2005). Several tree grevilleas were present, only one of which was in flower, that being *Grevillea juncifolia*. A quick look for the early stages of the butterfly on that plant was not successful. The large tree hakea *H. suberea* was also in flower in the region at the time but no *C. cyprotus* was seen flying near the tree.

Figure 1 *Grevillea pterosperma*, Goog's Track
Photo Roger Grund

During the early spring of 2011, Proteaceae plants were investigated by the author along the Goog's Track to the north of Ceduna. No adults were ever seen flying. Some small straggly tree Proteaceae were in flower; being *Hakea francisiana*, *Grevillea pterosperma*, and *G. juncifolia*. Initially no indication of early stages were seen, but after several days of intermittent looking, a single small larvae was seen on the white flowers of *G. pterosperma* (Fig. 1) where it was living within the flower cluster and its presence was indicated by eat marks, frass and attendant ants. A yellow flowered *G. juncifolia* (Fig. 2) was growing nearby, and the flowers of that plant were also examined for early stages, without luck. The flowers of the latter plant when young or in bud are covered in

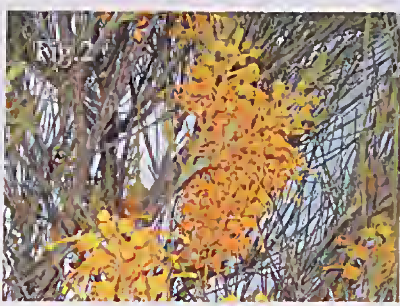

Figure 2 *Grevillea juncifolia*, Goog's Track.
Sticky nectar on young flowers make this an unlikely host for *C. cyprotus*. Photo Roger Grund

sticky nectar, which would likely prevent oviposition by female *C. cyprotus* and would certainly stop movement by the larva. When mature the flowers lose the stickiness but the flowers then have a tendency to drop off the tree, creating an unsafe situation for any early stages. Presumably, the similar yellow flowered *G. eriostachya* would also be unsuitable as it too has nectar-dribbling sticky flowers. No early stages were recovered from the pink flowered *H. franscisiana*.

Subsequently on the same trip, small red flowered bushes of *Grevillea sarissa* ssp *umbellifera* (closely related to *G. huegeli*) were investigated northwest of Ceduna, and eventually several *C. cyprotus* eggs were noted on the flowers.

The single larva from the *G. pterosperma* was taken back to Adelaide and reared on refrigerated *G. pterosperma* flowers. It eventually pupated and is presently still in the pupal stage.

Figure 3 *Caudalides cyprotus*, a mature larva similar to the one collected from *G. pterosperma*
Photo Roger Grund

The tree grevilleas tend to replace the low shrubby Proteaceae plants in outback mallee areas of SA, and after the above results it is likely the presence of *C. cyprotus* in central Australia would be supported by the tree Proteaceae.

In a similar context, the white flowered *Hakea mitchellii* (syn *muelleriana*) growing in temperate areas of South Australia has been reputed to be a likely host plant for the butterfly (Braby 2000, Grund 1997), but has yet to be documented as such. The females have recently been noticed flying around these flowering plants in the Upper Southeast (A. Stolarski pers. comm. 2011) and it is expected that plant will ultimately be found to be a host.

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Significant Range Extensions of Two Iconic Australian Dragonfly Species (Odonata: Anisoptera: Libelluloidea)

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Abstract

For the first time, *Apocordulia macrops* Watson is recorded from very low altitude in the Hunter River, well east of its known range. In addition, *Austrocordulia leonardi* Theischinger is recorded for the first time north of Sydney, and also north of the Hunter valley extending its known range almost 200 km further north. These significant range extensions and relevant associated circumstances are discussed. Updated maps for both species including actual and predicted distribution are presented.

Introduction

The rarely collected Nighthawk (*Apocordulia macrops* Watson, 1980) has been viewed as a "Murray Darling Icon" due to its particular and limited distribution (Theischinger et al. 2012).

The Sydney Hawk (*Austrocordulia leonardi* Theischinger, 1973), was hitherto known only from a very restricted area in the southern and south-western suburbia of Sydney (Theischinger 1973, Theischinger et al. 2009). For this and other reasons it is listed as an Endangered Species in Part 1 of Schedule 4 of the *NSW Fisheries Management Act 1994* and included in the category VU B1+2c in the IUCN *Red List of Threatened Species*.

Recent collecting presented unexpected and significant range extensions for both species. They are discussed below.

Apocordulia macrops Watson, 1980

It appears that the publication of the known distribution of *A. macrops*, spanning 28.6130-38.1500°S/144.0408-150.3660°E, 85-270 m asl (Theischinger et al. 2012), was quite timely as the discontinuation of the MDB SRA project was announced only weeks later. Only three months later, however, the Coastal Monitoring program of the Office of Environment and Heritage provided a very unexpected find that somewhat shakes the status of the species as a "Murray Darling Icon".

Whereas most sites sampled in spring 2012 in the Hunter catchments were at high or moderate altitude and showed promise for one or the other type of fauna, a site on the Hunter River near the Elderslie Bridge (32.6106°S/151.3466°E), sampled at about 1330 hrs on October 15, appeared very unspecific, unappealing and habitat poor (Fig. 1). In a small section of the sampling reach, however, the almost still, turbid yellowy tinged water was deeper (>1 m) and the bank was steeper with an abundance of logs (Fig. 2) reminding GT right away of habitats where *A. macrops* had been found in the Murray Darling Basin. Whilst sweeping, some extra attention to the logs where adults of *A. macrops* usually emerge almost immediately paid off by spotting an exuvia followed by three more within approximately five minutes. Also found were an exuvia each of *Austrogomphus australis* Dale and *Nannophlebia risi* Tillyard. This discovery of *A. macrops* represents its first record from a coastal New South Wales stream where at only 16 m asl and in open flat country the water gets very warm in summer, and the species could have emerged as early as September. Evidence that *A. macrops* are breeding at the site may indicate that in the cooler and higher altitude regions it occupies further

Fig. 1. Collecting site (Hunter River at Elderslie Bridge) of *Apocordulia macrops*. Photo S. Jacobs.

south, it may be able to tolerate the stresses projected to happen with global warming. As delightful as this discovery was, it unfortunately also shows that monitoring programs restricted to collecting larvae at certain seasons can miss important components (larvae of *A. australis* and *N. risi* were also not collected by sweeping). As well as using experience to guide additional searching as happened here, a little extra effort could involve for example digging for larvae (Theischinger & Jacobs 2008) or including adults such as stoneflies in suitable reach habitats (Theischinger et al. 2011). It may be that data from broader collection may not always suit projects with a specific design and aim, or meet the needs of modelling studies. However, such finds can provide valuable additions to the knowledge of fauna, their distribution and ecology, and deliver data relevant for future conservation, biodiversity and climate issues.

Even though the new record of *A. macrops* is by far the easternmost for the species, in a coastal stream and at a much lower altitude than all MDB localities, based upon modelled distribution it falls just within what was considered "suitable range" prior to this find (Bush et. al. in preparation) (Fig. 3a). The model predicts suitability based on matching environmental conditions (climate and catchment characteristics) from existing record locations (Bush, in preparation). With so few records available to begin with, it is encouraging to see how even major range extensions can fall within modelled expectations.

The collecting site of *A. macrops* at Elderslie Bridge (Figs 1, 2) is in a very broad valley with almost no shading of the river which, at moderate water level, is on average approximately 40 m wide. The banks are generally moderately steep (10-45º), to very steep (>60º) in a few places. We saw very little cover of detritus and algal growth, and no macrophytes were present in the water. Approximately 70% of the bank was vegetated, which apart from a small proportion of Eucalypts and Willows, was all grass and weeds. The remaining bank area was exposed sandy edges. At 1330 hrs the following water quality measurements were taken: temperature 20.81°C, pH 8.55; conductivity 1.10 mS/cm; turbidity 29.1 NTU; dissolved oxygen 11.7 mg/L, alkalinity 220 mg/L.

Fig. 2. Emergence (and probably breeding) habitat (Hunter River at Elderslie Bridge) of *Apocordulia macrops*. Photo G. Theischinger.

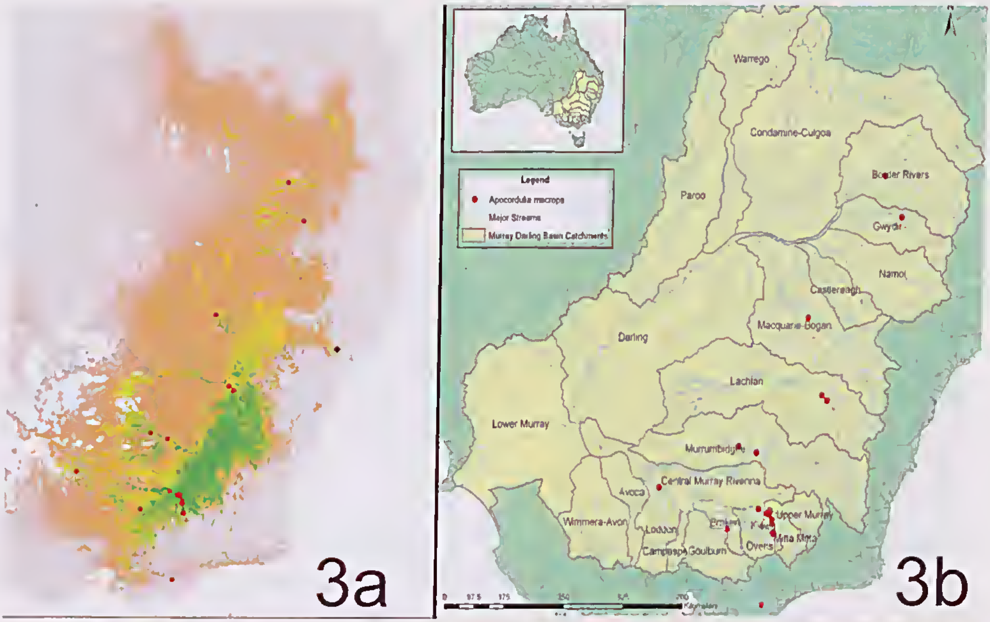


Fig. 3a. Predicted range of environmentally suitable conditions for *Apocordulia macrops*. Green areas represent higher environmental suitability. Published locality records used to build the model are shown in red, and the new record is in black. Photo A. Bush. Fig. 3b) Published range (modified from Theischinger et al. (2009).

Fig. 4. Early instar larva, ventral view, of *Austrocordulia* sp.: a) *A. leonardi* (from Karuah River);

b) *A. refracta jurzitzai* (from Werriberri).

Photo G. Theischinger.

Austrocordulia leonardi Theischinger, 1973

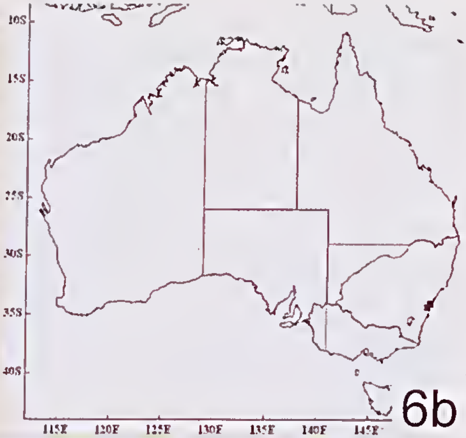
The published distribution of *Austrocordulia leonardi* spans just 150.61-151.05°E and 34.02-34.34°S (Theischinger & Endersby 2009). However more than 10 years ago an early instar *Austrocordulia* larva (Fig. 4a) from New South Wales, Karuah River, Dam Site, 32.2744°S/151.9011°E, was identified by GT as *A. leonardi*. It represented the first evidence of *A. leonardi* north of Sydney, and moreover north of the Hunter valley, a well known region of taxonomic disjunction in freshwater-insects (Watson & Theischinger 1984). This find was not published as there was still hope to get larger larvae or even adults. A private collecting trip by GT to the locality only succeeded in finding two exuviae of *A. refracta refracta* Tillyard, whereas several samples from nearby areas collected during monitoring programs did not include any *Austrocordulia* larvae. It was left to the Dutch odonatologist Vincent Kalkman to record a female adult of *A. leonardi* flying together with *A. r. refracta* at Chichester River/Ferndale Campsite, 32.2425°S/151.6963°3E, 130 m asl on 25/12/2011. It is now clear that *A. leonardi* does indeed occur north of the Hunter River. Based on the available material, the Hunter valley does not appear to represent a zone of taxonomic discontinuity for *A. leonardi* as has been found for *A. refracta* (Theischinger 1999), with *A. r. refracta* known from north of the Hunter River and *A. refracta jurzitzai* Theischinger to the south. This would make sense as *A. leonardi* is possibly restricted to larger streams in more coastal areas, whereas *A. refracta* mainly occurs in smaller streams at higher elevations, although it does extend to lower altitudes. To facilitate future research morphological differences of the exuviae of *A. leonardi* and of both subspecies of *A. refracta* are presented in Fig. 5.

Fig. 5: Final instar exuviae, dorsal view of *Austrocordulia* sp.: a) *A. leonardi*; b) *A. refracta refracta* (from Karuah River; c) *A. refracta jurzitzai* (from Werriberri). Photo G. Theischinger.

As before, even though the new records of *A. leonardi* are almost 200 km north of the previously published range and further inland, they are just within the modelled "suitable range" (Bush et.al., in preparation) (Fig. 6a). Once updated these models for both *A. macrops* and *A. leonardi* are likely to extend the limits of potentially suitable habitat still further. Despite the range extension for *A. leonardi*, the models do not yet account for the extensive habitat degradation that has occurred, particularly of coastal catchments. Given the fragmented nature of the records and ongoing development of Sydney's suburbs, *A. leonardi* is still of high conservation concern.

Fig. 6a. Predicted range of environmentally suitable conditions for *Austrocordulia leonardi*. Green areas represent higher environmental suitability. Published locality records used to build the model are shown in red, and the new records are in black. Photo A. Bush.

Fig. 6b. Published range from Theischinger & Endersby (2009).



Summary

Final instar exuviae of the rare *Apocordulia macrops*, hitherto almost exclusively known from the Murray Darling Basin, were recently found in the Hunter River near Elderslie Bridge. This is the first record of the species from a coastal stream in New South Wales and extends the hitherto known range east by almost a full longitudinal degree.

An early instar larva and a female adult of the threatened species *Austrocordulia leonardi*, recorded from Karuah River and Chichester River respectively, extend its exceedingly small published range (southern and south-western suburbia of Sydney) north by almost 1.5 latitudinal degrees. Implications of these discoveries regarding climate change and zoogeography are discussed.

Acknowledgements

Dr B. Chessman (Sydney) is thanked for providing information on the Karuah River collecting site, Mr M Krogh (Sydney) for reading the manuscript and providing helpful suggestions.

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Additional Range Extension Records for Various Butterflies throughout Australia

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Introduction

Whilst the author travelled throughout Australia during the last three years 17 butterflies were recorded outside their normal range as indicated in Braby 2004. Photographs of adequate quality to confirm identification were taken in most cases. These records generally occurred on touring-camping trips from Melbourne.

These records are additional to the 41 previously published in Victorian Entomologist Vol. 38 No. 2 in April 2008 and the 51 previously published in Victorian Entomologist Vol. 40 No. 6 in December 2010.

Methods

Most butterfly sightings were opportunistic, with only one destination targeted specifically to find the butterfly. When a butterfly was seen it was photographed, if possible. The images were then used to identify the species from Braby 2004. A large magnifying glass was often used for detailed inspection of the images in the field guide. Trip lists were kept for all butterflies seen each day and 'out-of-range' sightings were noted on these lists. No attempts were made to catch any butterflies by netting or any other means.

Photos were taken with a hand held Canon Powershot SX20-IS compact digital camera, generally set at x40 to x80 (x20 optical and x2 to x4 digital; which is equivalent to a 1120 to 2240 lens for a 35mm film) at a distance of 1000mm minimum. Digital zooming was necessary for the butterfly image to sufficiently fill the screen to ensure focusing on the butterfly rather than background items.

09 Glistening Line-blue Deepwater NP See table p. 12

Results

Details are listed in Table 1, with approximate 'out-of-range' (OoR) distance (km) and direction from the closest edge of the range shown in Braby 2004. One record is outside the indicated temporal distribution.

Discussion

Record photos were taken except where indicated by # in Table 1. Thanks to Geoff Walker for kindly reviewing these and verifying the author's identifications.

The Black-spotted White (No 1) is an older record but fills a gap in the temporal range given in Braby 2004.

The Monarch (No 2) was seen with Alan Reid who has lived on Flinders Island for several years and has observed the Monarchs to be resident.

The Mauve Line-blue (No 6) was not recorded on the Christmas Is NP List and the ranger has been advised.

The Spotted Jezebel (No 15) was a very fresh female that settled overnight in a bush next to our camp.

The author is aware that experienced butterfly enthusiasts prefer the use of Latin names for reference to species; however the use of the common names is much easier for those at the bottom of the learning curve. All common names are as used in Braby 2004.

Thanks to Michael Braby for encouraging me to publish my initial findings some years ago.

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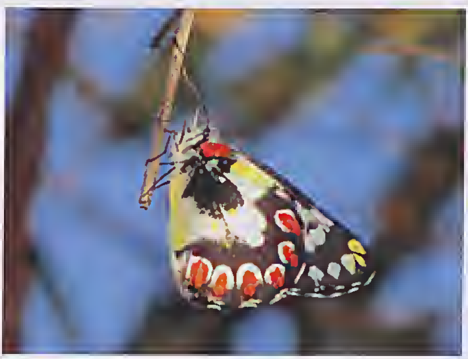
TABLE 1

SPECIES	LOCATION	DATE	LAT.	LONG.	OoR
01 Black-spotted White - t	Rainforest Mitchell Plateau	3-7-07	14 37	125 48	t
FLINDERS ISLAND TRIP 12-10					
02 Monarch#	Flinders Island	9-12-10	40 00	147 55	100N
03 Cabbage White	Flinders Island	14-12-10	40 00	147 55	200NE
EAST GIPPSLAND TRIP 01-11					
04 Chequered Swallowtail#	Gypsy Point	20-01-11	37 29	149 41	100S
05 Orchard Swallowtail#	S of Waygara	20-01-11	37 46	148 18	100E
CHRISTMAS ISLAND TRIP 03-11					
06 Mauve Line-blue	Christmas Is	8-03-11	10 25	105 40	n/a
MALLACOOTA TRIP 12/11					
07 Macleay's Swallowtail#	Genoa Peak	3-12-11	37 32	149 39	150S or 100W
08 Dusky Knight~	Waygara	23-02-12	37.7545	148.3224	250SW
QLD TRIP 6/12					
09 Glistening Line-blue	Deepwater NP	7-6-12	24.2905	151.9546	150NW
10 Glistening Line-blue	Agnes Waters	8-6-12	24.1816	151.8903	150NW
11 Scalloped Grass-yellow	Agnes Waters	14-6-12	24.2487	151.8592	50SE
WA TRIP 10/12					
12 Cabbage White#	Ceduna	24-9-12	32 08	133 40	150NW
13 Small Grass-yellow#	Coast 75k e of WA border	25-9-12	31 36 26	129 46 31	100S
14 Spotted Jezebel	Nullarbor 20k e of WA border	25-9-12	31 36 16	129 12 33	700E or W
15 White-veined Sand-skipper	Caiguna Blowhole	26-9-12	32 16 38	125 25 51	70W
16 Cabbage White#	Ceduna	6-11-12	32 08	133 40	150NW
17 Cabbage White#	12k e of Ceduna	7-11-12	32 07 30	133 49	140NW

\# - No photograph for this record
t - Outside indicated temporal range
~ - Thanks to Ross Field for advice re this location



14 Spotted Jezebel   20k e of WA border

11 Scalloped Grass-yellow   Agnes Waters

Overview of the Butterfly Database:
Part 7 – Descriptions of Provenance and Promotion of New Trends

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Introduction

The previous part in this series (Dunn 2011) examined the measure of uncertainty in incoming information and explored the knowledge gap – the substantial lost component of observations that has arisen across time. The gap, which has been responsible for some of the unevenness of the holdings, resulted because most observers did not archive field records (meaning, those adults seen but not retained for the cabinet). This seventh piece continues the project overview; it examines the components of the provenance, it discusses common ambiguities that have arisen in the past, and in doing so, it reinforces the need for quality of labelling so that information compiled will be accurate and useful for centralisation. To improve aspects of clarity it presents a template of bearings for contributors to use for written descriptions of sites. It also advocates for the inclusion of Global Positioning System (GPS) coordinates to a resolution of one-minute (the minimum standard required) or finer, and which the record provider is best to assign personally to ensure exactness (rather than leave it to a later investigator). The database makers (KL Dunn & LE Dunn) recommend resolution to one decimal place of a minute to improve the mapping strategy; however, the use of seconds – an increasingly common practice now – is also encouraged where suitably applied.

20. Digital technology and label documentation – promoting new trends

Digital technology has empowered amateur survey work and, accordingly, has enhanced the data quality received from record contributors over recent years. Electronic devices provide precise coordinates for biological survey (indeed, to beyond the specifications of this project); they can reduce the need to purchase high-resolution topographical maps, as was traditionally required to pinpoint manually many remote sites visited – once an involved process that required care to achieve accuracy. To this end, the Internet satellite-mapping system *Google Earth* (www.google.com) with its overlaid carriageways, visible land contours and convenient curser point-displayed coordinates (in adjustable units) has become an indispensable biogeographic tool. Mobile phones now provide access to this in the field too, at least where signal coverage is available outside cities and sizeable towns (albeit that at the time of writing, depending on the service provider subscribed to, coverage may be patchy and in many cases non-existent in much of inland Australia). Most reliable for use in the outback (at this time of report), are hand-held battery-operated GPS receivers intended for trekking; these can track variably to within three to ten metres by triangulated reference to several satellites. At times, though, the reliability of some units may be degradable, with variance of up to 100 metres from a true reading in certain circumstances. Nonetheless, they are easy to use, cheaply available and do not incur data usage fees. They display an approximate elevation too – very useful for upland regions where, for some species, spatial distributions may stratify vertically as well horizontally; inclusion of these data will enhance the label information; Turner (1939) encouraged this for much of Tasmania decades ago but some later lepidopterists have not adhered strongly to his advice.

21. Documentation of locality: what to include, and what accuracy is useful and why?

Provision of information for this project on butterfly distribution should be in the standard format required for insect specimen labels – see Braby (2000: 41) for the usual recommendations. Most important is the provenance, which includes two descriptive components as assertions, each subject to degrees of accuracy:

1. A clearly written description of the locality, with a distance and directional bearing from a fixed point of reference where needed, and
2. A geocode (coordinates along parallels of latitude and meridians of longitude, desirably resolved to one decimal place of a minute or seconds if appropriate).

21(i) Compass bearings clarify assertions – assumptions and cautions on usage
A compass bearing is an informative part of the descriptive statement of provenance. Over the decades, the use of a preposition, such as 'near', to associate an outlier site (whether a named place or not) has been a common and acceptable practice on specimen labels (and one this writer has utilised from time to time) but it is better to use directionality. A compass bearing needs anchorage to a fixed point to indicate the site, a link usually defined relative to a township marker or a prominent landmark. A Post Office (a standard point of reference in a township and one that is usually fixed) or a trig station (or similar landmark) in a wilderness area are each equally suitable and recommended first choices.

We (the database makers) have used a template of commonly cited compass bearings (Fig. 8) as a map-overlay to geocode statements of provenance, where the assertions recorded on specimen labels and on other records included unit distances (metres, kilometres or miles) from fixed points. The named bearings, which have appeared on records from CSIRO field surveys since the late 1960s, are useful to indicate the general directions of where the survey sites were. Other information such as road names may need to supplement these as the bearings serve as guidelines (close approximations, not exact directions) and, obviously, these are more accurate at near range than farther afield. The chart appears in landscape format so that it occupies a full page; that way it can be printed or photocopied onto a clear plastic sheet (OHP transparency film) for personal applications. Those who contribute regular field observations to this or other projects or who wish to add bearings to their specimen labels may find it helpful.

The initials that designate bearings (see Fig. 8) may be subject to confusion at times. That is because they involve combinations of the same sets of letters and look similar to one another. For this reason, due care is required when transcribing label data from museum specimens for use in publications or databases. I have noticed instances in taxonomic literature where several of these compass bearings have been misinterpreted or copied inaccurately and so documented differently by later examiners. One report in 1997, published in the *Australian Journal of Entomology*, listed a specimen labelled as 'Laura Gorge, 11km SE by S of Laura' but with the direction mistakenly transcribed as 'SSE' (p. 154). Errors like this example, detected in Braby (1997), were present in the butterfly atlas work (Dunn & Dunn 1991) as well; three localities with bearings incorrectly rendered as 'NE' (see pp. 17, 261, 389) were each as 'E by N of Mt Cahill' on the labels. No doubt, others are scattered in the literature but this is not the place to document them all. The several examples given flag the need for special care.

21(ii) Accuracy of Provenance – the written assertion needs to be clear and unambiguous
An accuracy to within an area of one square kilometre for field observations (meaning a radius of about 500m, as an acceptable variance from where a record of a species of butterfly was made), has been the aimed for standard since the project's inauguration. That measure will enable the assignment of geographic coordinates to one-minute resolution. Equipped with this basic information, the database makers (as later investigators) were able to assign, with reasonable confidence, a geocode to each record in the database, where one had not been included as part of the locality description. That aim, now well known, was to present the information spatially on maps (see Dunn & Dunn 1991), and for the most part a literal interpretation (a database protocol) rendered void any ambiguities contained therein (Busby 1979) which made the task practicable. Wherever possible, though, a record maker should make assertions unambiguous to avert the need to apply such an assumption; the discussion that follows will assist that process.

The assertion of provenance may include some embedded assumptions; it may presume some local knowledge of fine placenames, assume familiarity with local geography and those landforms visited, or require history of contributors' regional movements to pinpoint sites visited. In essence, certain factors left unstated may have seemed obvious at that time to a record maker, but these aspects may

be unclear to a later investigator (who attempts to provide a geocode by proxy). For these and other reasons, uncertainties may arise across time that can erode the assertion's veracity. Take, for an example, a familiar descriptor such as '43km N of Yanac, Vic'; this locality is similar to many that appear on museum labels attached to butterflies (and other insects) derived from the Big Desert, a remote wilderness in Victoria that is popular with insect collectors. The assertion looks straightforward but contains three issues that give rise to ambiguity, each discussed in turn. Firstly, it does not specify whether the measure given in kilometres was by beeline or road. Road distances can vary considerably from the direct distance, particularly if the road has one or more sharp bends. Secondly, odometers (trip meters) lend themselves to error. Accuracy to within +/- 4% was a requirement until July 2006, but "there is now no requirement to have an odometer, and therefore there is no accuracy requirement" (RACQ 2012). Moreover, the offset from a true reading can increase where physical factors assumed in the calibration have been modified (Hardy 2012). Factors that contribute to variation in road measures include tyre wear, underinflated tyres (used on sandy tracks – the road surface in the 1970-80s at the site concerned), oversized tyres fitted to 4WD vehicles to improve clearance, and modifications to rim size. Changes to the differential ratio, the extra load carried (when on a lengthy field trip), and faulty instrumentation – where the device has fallen out of calibration – will each have an effect too (Hardy 2012). Measures from the nearest roadside marker (where available) should improve accuracy; otherwise, for the distance specified (43km), this would incrementally increase the effect of one or more of these factors (allowing for counter-balancing effects of some) to an extent that it may offset the assigned geocode by a minute or more from the intended site. This variation also cancels the high precision intended in those cases where kilometres (presumably measured by vehicle odometer, but maybe not) have been finely specified to one decimal place (or even to two), as has been seen on specimen labels, in the literature or in supplied field inventories. Thirdly, for measures by road, it is important to know the exact point of origin, namely, where the odometer was set at zero. Some contributors of similarly labelled records (to the example under discussion) likely measured northward along the Nhill-Murrayville Road (formerly 'track'), from the Maude Street intersection, situated 2km west of the Yanac settlement (as was the practice of this writer over the years). Others may have included that westerly distance along Maude St in that 'northerly' component specified on the labels – a method that adds about 4.6% for that deviation and so overstates the northerly distance involved. Indeed, one or more perhaps measured from the commencement of the Nhill-Murrayville Road at the Nhill-Yanac Road junction (south of Yanac but supposing they were actually more or less west) therein adding 3.7km to the northward component (an error of nearly 8.6% in such a case). These multiple factors, whether acting together or separately, can increase disparity between the literal interpretation of that label and the true place of origin of the material concerned (likely at, or near, the trig station atop of the prominent sand dune for the example discussed).

Many contributors of butterfly records have attempted to provide exactitude to enhance the scientific content of their locality information. This is commendable but in doing this, the assertions of provenance may become lengthy, complicated, and sometimes difficult to interpret. In particular, in remote wilderness reserves or large state forests, localities may be very difficult to describe without references to road names, road junctions and distances from the junctions or other fine markers. In addition, in some forestry areas the road placements may vary across decades as a part of changes in land-use management. This adds in another layer of difficulty for later investigators who are unaware of such changes and assume the road placement has been unchanged. There are times then when a written description on its own is not enough to assign coordinates to one-minute resolution accurately, other than by good estimation. As an aside, collectors often find it difficult to handwrite labels small enough to fit beneath a pinned insect (and yet still be readable from above without undue handling of the specimen), as well as to include on it such additional information to give a higher accuracy. Museum curators are well aware that a label that protrudes beyond a small insect's wingspan poses a storage concern; it takes more space for starters and the label itself may place at risk, interfere with, or potentially damage wings, legs or other protruding appendages of adjacent specimens during handling required for routine examinations.

Coordinates offer entomological enthusiasts an ideal solution to limit label size because they reduce the need for highly detailed written statements that are required and often provided in the absence of clear landmarks. They are invaluable for those 'hard-to-describe' places and, these days with access to GPS in the field, may soon become an obligatory part of the label information. However, it is important to maintain the balance here. In a similar way that a descriptive statement may not be sufficient alone (in the event of ambiguities contained in it – as the case for the Yanac example), it is not appropriate that a geocode should standalone either, even though GPS coordinates provide a superior assertion of provenance. Unfortunately, mistakenly transcribed digits (all too frequently seen among records provided) or those given in a wrong sequence (another commonly encountered event) can seriously misconstrue the intended locality (see section 21 iv). Instead, the provision of two pieces of information (a written description and a numeric code) on the specimen's label or as documentation for a photo voucher will improve the record's veracity. A map with a point marker may serve valuably too (as secondary support for field inventories) to confirm the coordinates provided in absence of a locality name, but the inclusion of the proverbial description (as well as a numeric one) remains essential in this database project. Used in juxtaposition the two assertions should remove most if not all ambiguities that might arise in the effort to finely plot the intended site. Thus the rendition of the working example as '43km N of Yanac (by road from west junction), Vic, at 35°46.1'S, 141°23.1'E' is an improvement. The extraneous information in parentheses may be optional; a GPS to an appropriate resolution clarifies the site anyway.

21(iii) Accuracy of coordinates – a geocode needs to be an appropriate resolution
Unlike plants, butterflies are mobile organisms; the adult represents a dispersal stage in the lifecycle of the insect, so in providing a geocode for a field observation a resolution needs to be determined that is appropriate to such an animal. That resolution would need to suit the majority of records (if not all) gathered during a snapshot field survey – an inspection of short duration (a typical constraint on amateur contributions) – that confines the take to a limited area surveyed on foot.

The database project, primarily established to collate information from museum specimens, attempted to define a site to one-minute resolution – a 60th of a degree – as a convenient unit for all historic records. This baseline grid was considered very finely resolved for a map-plotting purpose in the 1980s. Its choice, as a best compromise, also served suitably to utilise the extensive archival information in the literature on which scientific knowledge of butterfly distribution has hinged firmly. Yet, this resolution equates to a moderately sized area. The length corresponding to one minute along the vertical scale is about 1.85km and fixed, but the width in kilometres along the horizontal scale varies slightly from north to south (according to latitude); at the equator, a minute plot is more or less square. In Australia, the width of a minute ranges from 1.82km on Cape York Peninsula in northern Queensland to a smaller distance of 1.35km near the Tasman Peninsula in southern Tasmania (a variance of about 26%). Thus in the Southern Hemisphere, where Australia lies, a minute^2 becomes increasingly rectangular to the south. Nationwide, the area that a square minute occupies ranges from 3.37 to 2.50km^2, potentially too large to resolve distribution finely but passable for lower resolution maps, such as those released by Dunn and Dunn (1991). A square minute, situated near the border of South Australia and the Northern Territory in central Australia, has broadly typical dimensions of 1.85 x 1.67km and provides an area of coverage (3.09km^2) that would be close to the median occupied nationwide. These dimensions, treated as generally representative for the purposes of this paper, enable estimates of areas of finer resolution that may be more suited to certain biological surveys.

(a) The classic resolution – one square minute – and its versatility
The localities provided on many labels on insect specimen from the 20th century were often rather generalised. Many barely met the exactitude of one square minute except by a literal interpretation or application of one or more assumptions to make an assignment of a geocode possible to that resolution (see Dunn & Dunn 2006). The intended accuracy of the historic collectors is one of the reasons for this (see Edwards 1999 for discussion); as the facts stand, these workers – mostly keen amateurs rather than professional entomologists (Moulds 1999) – were not labelling their material with a pro-

viso of map plotting in mind. However, over the years, field observations have become a substantial part of the database holdings (Dunn 2008, 2009) and many of these have given localities finely. Moreover, during the last 25 years or so, ecological and related studies of butterfly distribution and their meta-population structure have suggested that some spatial patchiness is evident for many species (Hanski 2003). Even where much habitat remains, some endemic species can be restricted to certain small areas where a complex combination of essential requirements exists (see Prince 1988a, 1988b, 1993, Crosby 1990, Neyland 1992, Dexter & Kitching 1993, New 1993, Dunn & Kitching 1994, Braby 1996, Sands 1997, Sands & New 2002, Braby & Douglas 2004, Eastwood *et al.* 2008 and others). For some habitat-specialists then, the area of one square minute resolution (about 3.09km^2) may be considerably larger than a disjunct local population might occupy. Some lycaenid species (particularly certain habitat specialists) in Australia and USA can survive in a tiny patch size of about 1-3 hectares or equivalent areas (Dunn & Kitching 1994, New *et al.* 2000, New & Sands 2002a, Crone & Schultz 2003), with one report of an Australian Hesperiid population occupying only 600m^2 (Sands 1997). Obviously then, a finer resolution than one square minute is desired as a contemporary standard to quantify species' presence in the field, particularly for those groups that show disjunct distributions, narrow ranges or spatially patchy populations (see New & Sands 2002b for an overview). This finer resolution, applicable to vouchers for research projects or other studies and for contemporary field lists, is additional to and separate from the historic standard (one minute^2) tuned to the circumstances of museum labels and their accuracy constraints. With ease of access to GPS in the field (via wireless-networked laptops, digital cameras, mobile phones or trekking devices) a higher resolution has become common among submissions in recent years and these fine designations are included in the database where provided.

Although many surveys may be intended to produce short lists (for a small area within a limited period), there are times when enthusiasts (collectors and photographers) wish to seek out a particular species of interest or compile a more representative list for an area that seems species rich (relative to other areas examined). Up to three hours or more may be required to achieve this (see Dunn 2001, Dunn & Franklin 2010), and during that timeframe randomised or structured walks will likely exceed 700m in each of the four principal directions, even though focus may remain on a particular subarea. Importantly, it is very likely too that all vouchers taken will receive identical labels (that is, grouped as part of the same sampling event). As a guideline then, for broader survey the classic square minute resolution (rather than a finer one) would better define the area examined. That coarser resolution will include the subarea and, likely too, all the outermost records obtained and so present the label data (as applied generally to each record) with truthfulness.

It is a common practice when visiting National Parks and large bushland reserves to walk several kilometres to scenic attractions, and on such occasions, periodic GPS tags can group the species encountered en route. An 11km long transect in upland Tahiti walked several years ago by this writer (Dunn 2012) provides an example of how intervals, irrespective of whether incremented by minutes or kilometres, can separate the findings on a lengthier trail. Collation of lists of species seen for each one-minute interval on overland hikes (particularly through largely similar bushland, which will more likely have a uniform fauna) will bring with it the benefit of lessened data handling than would be the case with a finer grid. However, within each broad interval of about 1.5km distance (variably equivalent to about one-minute) attention might focus on particular habitat types, creek crossings or landforms as these often include their own suites of species. Hence, some subareas may require separate GPS coordinates of a finer resolution to enhance a bushwalking or trekking survey.

(b) Resolution to one square second – a high precision for aerial insects

A fine resolution to a square second could be applicable to field observations that involve individual records of particular species (and those in their company, if found within the confines of the defined region). A second – a 60th of the classic resolution (a minute) – equates to a small area of about 31 x 28m^2, arguably close to the median dimension for Australia. Inventory lists of species supplied for inclusion in the database in recent years have often given coordinates to seconds and many contemporary specimens bear labels with that resolution too. Although precise they may not be accurate,

and so the database makers treat very fine coordinates (seconds) on labels as 'rather generally' correct for the species concerned. They accept that within an implied exactness a 'buffer zone' of inaccuracy probably exists. That presupposed zone of ambiguity might circumscribe those outliers, likely seen and included at that same exactness – labelling convenience may be a common reason for doing this. Others may choose to assign seconds to specimen labels or field inventory lists (and in giving that precision likewise imply an accuracy that may not be there) for a different purpose; that being, perhaps, to assist their own return to the commencement point of their survey-walk at another time (or to enable other investigators to do so, possibly decades later). Selective use of the approximation symbol '~' preceding coordinates to seconds will clarify a measure of generality for these. It will improve veracity where a contributor suspects that a few included in the larger set were from a *limited* area beyond the confines of that stated resolution.

In general, a survey of an area of a square second – which might comprise four transect walks of about 14m each radiating from the central point and more or less aligned along the principal directions – would be too limited to find a variety of butterflies in the usual short time allocated. Even for a longer period of inspection, such a tiny plot of habitat would seem very unlikely to achieve an adequate list of the commonest species present, whose home ranges may include that plot across time. The reason being is that some species although quite widely dispersed, are not necessarily ubiquitously or uniformly so; others are localised and perhaps close by but beyond the area selected – too small an area then to chance an encounter with one or more of those. Moreover, adults often need rousing into flight to increase their visibility. This is achieved by inadvertently flushing them from perch sites (where they often present as unseen but vigilantly active) or disturbing them from shady roosts amongst foliage or debris (where they remain reclusive and well camouflaged) whilst walking past – a requirement that may not be achievable for a more-or-less stationary survey that a square second might impose. Species tallies are maximised on probability by surveillance of a wider area of habitat than the requisites of 31 x 28m^2 permit, a factor in the reasoning behind the sizeable transects utilised in population counts (Pollard 1984). Observations from a stationary point (where a resolution to seconds would be applicable) are more useful near foraging sites or on landforms where butterflies gather for purposes of mate location. Reflecting on this, application of the finer resolution seems less useful for all but those species that show strong site fidelity across generations, a butterfly behaviour which is more the exception than the norm (McCubbin 1971).

Some lycaenid and skipper butterflies are highly localised about particular host plants or trees that seem unusually favoured over others, and for those certain species in these groups a resolution to the square second (or even finer) can be useful. In one or more species of Thecline butterflies there are instances where the same individual tree may serve as a choice larval host for several years (McCubbin 1971, Dunn 2007), and in one report this usage extended more than 20 years (Braby 2011). Aware of this, some contributors have provided coordinates to three decimal places of a minute (an area of about 1.85 x 1.67m^2) for specific records. In the case of localised fauna, this very fine measurement will assist studies to determine whether historically documented populations are still extant. Botanical surveys may apply similar resolution to designate individual shrubs or trees, each being immovable; in that context then, this might be applicable equally to flightless insects or sedentary immature stages associated with a specific plant. That said it is important to check first, whether the desired resolution is within the intended reliability of the GPS device utilised, and second, whether it is useful to apply it to a particular aerial or highly mobile adult stage of an insect.

(c) Resolution to one decimal place of a minute – another option or a compromise

It is not expected, nor considered reasonable, that observers should provide specific GPS readings to seconds for each individual butterfly encountered – some grouping needs to take place, with coordinates of best fit applied to all records. Otherwise, much sorting and labelling will be required in the field (a time consuming process) to separate material and observations for each square second (a difficult task) to maintain that measure of truthfulness.

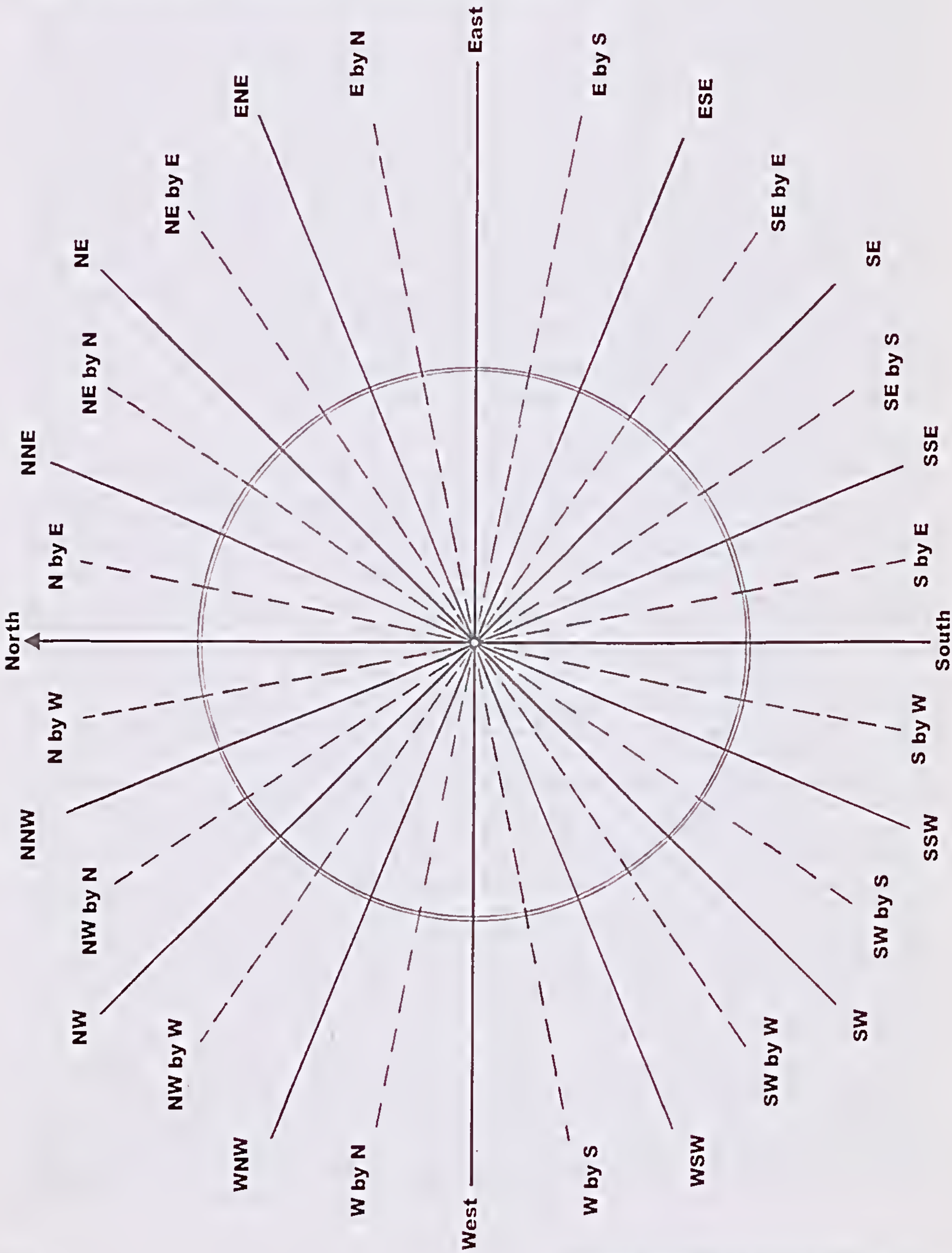
One decimal place of a minute (a tenth of a minute) – an area of about 185 x 167m² – seems more suitable for the majority of records gathered during a brief inspection. About 20 to 40 minutes in the field (varying according to latitude, prevailing weather and time of day) will achieve a short list (in this writer's experience). It represents a timeframe likely used intrinsically by many insect enthusiasts to enable them to survey a number of sites (and habitat types) during a day's outing. A quick walk of about 80m in each of the compass points from the centre point of the area will transect it, and is probably enough distance and habitat coverage to see one or more adults of various common species present at a particular site (appropriate to the season, of course). The rationale here is that two criss-crossed transects of about 160 metres each, walked several times until no additional species are seen, would likely equate to an observer's innate sense of 'sufficient time' spent at any one place. It is reasonable to assume too that a series of vouchers taken (or diary records compiled) under such means will receive identical labels – hence be treated as all from the same place in the mind of the gatherer. For unstructured surveys where the boundaries are not defined formally (and likely vague, as is arguable for some resolutions to one square second), the use of the symbol '~' will clearly indicate some minor variation. It may be suitably applied where the region examined edges beyond the decimal place given (and the mathematical error of a similar magnitude, included in that final significant figure), but is still close to it. This is preferable to 'force-fitting' cusp records into a set of coordinates for labelling convenience and avoids a false impression of exactness. For aerial insects then, a decimal place of a minute may provide a good compromise between a broad resolution of one square minute – coarse by today's standards – and a fine resolution of one square second (more useful for organisms of low motility or species that show site-tenacious breeding).

21(iv) Fine information enhances the database utility

It is informative to include minor placenames, such as parks or sites of interest, as a part of the location; these will specify the provenance more precisely than could the township name if used alone, particularly if the latter covers a large area of settlement. They will also corroborate with a finer geocode where that differs from the Post Office, as some townships (without named suburbs) cover an area of more than one minute². Importantly, fine placenames in addition to the location (settlement name) are useful for querying and perusing the locality field in a large database; each helps make sense of extensive information across linked fields; and each will assist assessment of the veracity of information per species in the holdings. A geocode supports this descriptive information powerfully but ought not to replace it – coordinates should not standalone as the only assertion of provenance. A visual examination across particular fields, which the database makers do from time to time to check if spatial and temporal distributions reasonably agree with current knowledge, is quicker to achieve by perusing names of localities. In contrast, a perusal of coordinates can be quite meaningless to reviewers (except in graphic displays); and spurious data that is overlooked because it is not easily recognised may cement itself into the scientific record through later citations in the literature. For example, in the case of dragonflies, a twisted picture of distributions from internet databases has arisen for several species. This has been due in part to cases where "the same or nearly the same localities" have been entered incorrectly, with their coordinates varying by 2-3 degrees from the real site (Theischinger 2008: 61). Transcribed records of butterflies are not immune either; one locality described in the literature as "along Cabbage Tree Creek at Taigum, a northern suburb of Brisbane (27°20'S, 142°32'E)" (Lambkin 2010: 131) was out by 11 degrees of longitude (the coordinates intended were 153°32'E). Another, with the provenance as "Buffalo Creek" NT, at the estuary mangroves, gave the longitude as 130.035°E (SJ Johnson cited in Meyer et al. 2006: 20), which is situated 87km west of Darwin, in the Timor Sea; the site intended is at about 130.90°E. Some information can be confused or wrongly transcribed onto specimen labels too; two series of various species in the ANIC labelled as "145km SE by E of Broome, 18°55'S, 123°27'E" and "163km SE by E of Broome, 18° 49'S, 123°17'E" have had their coordinates transposed. Availability of a descriptive locality has served informatively in these and other cases that have arisen where errors are evident. Such incidents obviously raise a cautionary flag: checking digits will ensure the accuracy of contributions, and provision of both components of the locality is necessary to resolve discrepancy where it arises.

Figure 8. Chart of Compass Bearings

Butterfly enthusiasts, whether garden observers or ardent explorers equipped with maps and notebooks for an intense spot of record making, may find this template handy as a map overlay in the field or when labelling specimens or photographic images.



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Corrigenda:

Butterflies of the Wingan Inlet area, Croajingolong National Park, East Gippsland, Victoria, including a January 2012 list, by Ian G. Faithfull and Kelvyn L. Dunn

VE Vol 42 No. 5 page 104 (2012): "A female has also been recorded at Gipsy Point by the second author and D.F. Crosby (Dunn and Dunn database)."

Read: Females have also been recorded at Gipsy Point by the second author and D.F. Crosby (Dunn and Dunn database).

Please ignore a previous corrigenda, see VE Vol 42 No. 6 page 114, which mistakenly rendered part of the original sentence by omission of the provenance

Corrigenda:

Papilio demoleus L. (Lepidoptera) in Victoria, November 2010 to March 2011: southward migration and northerly return migration, by Ian G. Faithfull and Kelvyn L. Dunn

Two editorial mishaps need correction. Vol. 42 No. 6 page 130 (2012): **Table 2** was replaced by a replication of part of Table 1 and so was missing; Table 2, as it should have appeared, is provided below. The Key to **Table 3,** included in the original document as submitted, was also missing in the published version (page 131).

Table 2. Locality and geographical coordinates of observation sites.

Knoxfield, 621 Burwood Highway, Dept. of Primary Industries	-37.874 ° 145.257 °
Doveton, Matipo Street	-37.994 ° 145.235 °
Cheviot Hill lookout, Point Nepean National Park	-38.311 ° 144.667 °
Frankston North, 40 Ballarto Rd., Dept. of Primary Industries	-38.116 ° 145.172 °
Loch, in township	-38. 368 ° 145.708 °
Rye, junction of Florence Drive and Melbourne Road	-38.380 ° 144.793 °
Carrum Downs, Lyrebird Drive, near corner Bowerbird Place	-38.106 ° 145.180 °
Dandenong, Heatherton Road at Simpson Drive intersection	-37. 970 ° 145.219 °
Mt Tassie, tower 1 (Nth), off Traralgon-Balook Road	-38.393 ° 146.559 °
Cardinia Reservoir, Duffys Road picnic ground	-37.970 ° 145.389 °
Rutherglen, 6.25 km SE; Chiltern Valley Rd, Dept. of Primary Industries	-36.098 ° 146.510 °
Swanpool, 2.5 km NNW; Lima Creek/Lima East Creek, Midland Hwy.	-36.724 ° 145.991 °
Lima South, c. 4 km N of Lake Nillahcootie; Midland Highway	-36.84 ° 146.01 °
Maindample, c. 0.7 km W; Maroondah Highway	-37.028 ° 145.924 °
Yea, c. 3 km NE; Maroondah Highway	-37.205 ° 145.463 °
Traralgon, Princes Highway near Peterkin St	-38.194 ° 146.545 °

Table 3. Key

[1] K.L. Dunn, see main text.

[2] K.L. Dunn. Flying along road, clocked by car speedometer, Lamnatu district, Tanna, Vanuatu, 7 February 2004, c. 11.30 h local time; hot and sunny.

[3] K.L. Dunn. Flying south-west in front of car, maintaining this speed (clocked by speedometer); Separation Creek near Lorne, Vic., 29 March 2011, 14.50 h (summer time).

Notice of Annual General Meeting 2013

Please be advised that the Annual General Meeting of the Entomological Society of Victoria Inc. will be held on Tuesday 16th April 2013 at 7:45 PM at the Discovery Centre, Melbourne Museum.

The purpose of the meeting is to receive reports of Council and the election of Office Bearers and Honorary Treasurer, Editor and up to eight other Councillors.

All positions are open and nominations are invited for council membership of the society.

Nomination forms are available from the Secretary, Steve Curle secretary@entsocvic.org.

Future meetings 2013

Tuesday February 19th 2013
Note 7:45 pm start

Victoria's Damselflies and Dragonflies in focus

By Nature Photographer: Reiner Richter
Venue: The Discovery Centre , Melbourne Museum

Reiner has kindly provided the photo of *Coenagrion lyelli* on the front cover of 2013 bulletin.

Council meeting dates: Council meetings: March 19, May 21st, July 16th, Sept 17th, Nov 19th

A number of people have been informally meeting up at Michelinos Trattoria Restaurant prior to general meetings. Any members who would like to meet informally at Michelinos – at around 18:00 – are welcome to join us for a pre meeting chat / food. www.michelinos.com.au/ 69 Pelham Street Carlton VIC 3053 (03) 9663 336

Month	*Date*	*Planned event*	*Topic*
February	19th	General Meeting Speaker: Reiner Richter Nature Photographer	Damselflies and Dragonflies in focus
April	16th	AGM	Speaker TBC
June	18th	General Meeting	Members' short presentations
August	20th	Members' excursion	TBC
October	15th	General Meeting	Members' short presentations
December	12th TBC	Excursion	Will be earlier then the 3rd Tuesday to reduce conflict with holiday celebrations.

OFFICE BEARERS

Thanks to Daniel Dobrosak, Marilyn Hewish and Ian Endersby for assistance in producing the Victorian Entomologist.

CONTRIBUTIONS TO THE *VICTORIAN ENTOMOLOGIST*

The Society welcomes contributions of articles, papers or notes pertaining to any aspect of entomology for publication in this Bulletin. Contributions are not restricted to members but are invited from all who have an interest. Material submitted should be responsible and original. The Editor reserves the right to have articles refereed. Statements and opinions expressed are the responsibility of the respective authors and do not necessarily reflect the policies of the Society.

Contributions may *preferably* be E-mailed to Internet address: editor@entsocvic.org.au. or posted to the Hon. editor in ***Microsoft Word for Windows*** with an enclosed hard copy. Tables should fit an A5 page with 1 cm borders as a maximum size. The main text of the news bulletin is prepared in 8 point, *Book Antiqua* font (please do not use fixed point paragraph spacing). The deadline for each issue is the third Friday of each odd month.

The Society's Home Page on the World Wide Web is located at:

www.entsocvic.org.au

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Tuesday 16th April
AGM and speaker

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